Remarks

Claims 1-12 are pending in the application. Favorable reconsideration of the application is respectfully requested in view of the following comments.

I. REJECTION OF CLAIMS 1-12

Claims 1-12 stand rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

More specifically, the Examiner contends that the Applicants introduced new matter by adding the contact hole is an elongated shape "having a major axis and a minor axis..." into claim 1.[1] The Examiner contends the added matter is not supported in the specification and it is not satisfactorily resolved, thereby raising doubt as to possession of the claimed invention at the time of filing. Applicants respectfully disagree with the Examiner for at least the following reasons.

Initially, Applicants note that it is not clear whether the Examiner is objecting to the portion of claim 1 quoted in the Office Action, i.e., "having a major axis and a minor axis", or whether the Examiner intended to include the entire portion of the amendment. As a result, Applicants will address each portion separately.

a. "having a major axis and a minor axis"

Per the MPEP, newly amended claims must be supported in the specification through express, implicit or inherent disclosure.[2] Applicants note that claim 2 as originally filed recited "a major axis of the contact hole..." and that claim 3 as originally filed recited "a minor axis of the contact hole...". In the Reply to the first Office Action, claim 1, as indicated by the Examiner, was amended to include "a major axis..." and "a

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[1] Final Office Action, page 2

[2] MPEP §2163(B) - page 2100-167, column 1

minor axis..." features, and claims 3 and 4 were amended to recite "the major axis..." and "the minor axis...", respectively, thereby indicating that antecedent basis for the major and minor axis could be found in amended claim 1. Thus, the subject matter of the contact hole having a major axis and a minor axis was disclosed in the claims as originally filed.

Moreover, the specification clearly provides support for such an amendment. For example, the specification discloses that the V_{SS} contact is formed in an elongated shape, such as an ellipse, wherein a major axis 58 of the ellipse is substantially parallel to the stacked gate layers 54, 56, and the minor axis 60 of the ellipse is substantially perpendicular to the stacked gate layers 54, 56.[3] Clearly, there is express support in the specification for the contact hole having a major axis and a minor axis.

b. "the contact hole is dimensioned along the major axis so as to maintain focus of an image of the contact hole as the minor axis is reduced in size towards a DOF limit"

The remaining portion of the amendment recites "the contact hole is dimensioned along the major axis so as to maintain focus of an image of the contact hole as the minor axis is reduced in size towards a DOF limit". As disclosed in the specification, DOF (depth of focus) in present integrated circuit fabrication is becoming so small that it is a concern as to whether optical wafer steppers are capable of maintaining the image in focus.[4] The present invention addresses this issue by improving DOF margin within the stacked gate layer.[5] More particularly, the elongated shape of the contact provides a contact pattern that minimizes DOF issues during fabrication.[6]

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[3] Page 5, lines 25-30 of the specification

[4] Page 3, lines 3-5 of the specification

[5] Page 3, lines 14-16 of the specification

[6] Page 6, lines 5-7 of the specification

Additionally, the specification discloses that the contact can be dimensioned along its major axis so as to maintain feature size above a threshold value, thus minimizing DOF issues.[7] As is known in the art, objects with smaller feature sizes have smaller DOF.[8] By maintaining feature size as the minor axis is reduced in size, DOF is not reduced or minimally reduced and, therefore, conventional optical wafer steppers can maintain the image in focus.

For example, and with reference to Figs. 1 and 2 of the present application, as the distance of separation 62 between stacked gate layers 54, 56 is reduced, the radius "r" of a prior art circular V_{SS} contact 12 and the minor axis 60 of the elliptical V_{SS} contact 52 also must be reduced. A reduction in the radius of the circular V_{SS} contact has the effect of reducing the size of the circular V_{SS} contact in all directions since, by definition, a circle is composed of all points having a distance "r" from a center point. As the radius is reduced, the entire circle is reduced, thereby reducing the feature size. The elliptical V_{SS} contact 52, on the other hand, only is reduced along the minor axis 60. The major axis 58 is not affected by the reduction in separation between stacked gate layers 54, 56. Thus, as the minor axis 60 is decreased to accommodate reduced separation 62 between stacked gate layers, the major axis 58 can be increased to maintain feature size.[9] Since feature size is not reduced, DOF is not reduced or only minimally reduced and, therefore, conventional optical wafer steppers are capable of maintaining the image in focus.

Thus, there is express support for the amendment to claim 1 adding the feature wherein the contact hole is dimensioned along the major axis so as to maintain focus of an image of the contact hole as the minor axis is reduced in size towards a DOF limit. Assuming for sake of argument, however, that there was not express support for the amendment in the specification, there also is implicit support for the amendment.

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[7] Page 7, lines 7-9

[8] See, e.g., Harry J. Levinson, Principles of Lithography, ISBN 0-8194-4045-0, page 37 (2001)

[9] Page 6, line 26 - page 7, line 12 of the specification

One skilled in the relevant art, reading the specification and amended claim 1, clearly would recognize in the disclosure a description of the invention defined by claim 1. More particularly, one skilled in the art would know that conventional optical wafer steppers run into focus issues as DOF becomes smaller. One skilled in the art also would know that objects with smaller feature sizes have smaller DOF. Additionally, one skilled in the art, after reading the present application, would understand that reducing the dimension of a minor axis of an elliptical contact does not have the same effect on feature size as reducing the radius of a circular contact. More specifically, one skilled in the art, after reading the present application, would understand that feature size of an elliptical contact can be maintained as the minor axis is reduced, e.g., by increasing the dimension of the major axis of the elliptical contact, thereby minimizing DOF issues. Since DOF issues can be minimized, conventional optical wafer steppers can maintain focus of an elliptical contact having a minor axis length of "2b", while a conventional optical wafer steppers could not maintain focus of a circular contact having a radius "r", wherein r = b (assuming r is below a DOF limit for the optical wafer stepper). Furthermore, one skilled in the art, after reading the present application, would realize that since DOF issues are minimized by dimensioning the major axis of the contact appropriately, focus issues of the optical wafer stepper are minimized. Therefore, the contact hole can be dimensioned along the major axis so as to maintain focus of an image of the contact hole as the minor axis is reduced in size towards a DOF limit. Thus, there is implicit support in the specification for the amendment. Accordingly, there is express and implicit support for the amendment in the specification and, therefore, the rejection under 35 U.S.C. §112, first paragraph is improper.

Additionally, the MPEP specifies that with respect to newly added or amended claims, the applicant should show support in the original disclosure for the new or amended claims.[10] Applicant respectfully submits that support for the amendment was provided in the reply to the first Office Action.[11]

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[10] MPEP §2163(II)(A) - page 2100-168, second column

[11] See page 5, 4th paragraph of the reply to the first Office Action

If the Examiner finds that the disclosure does not reasonably convey that the inventor had possession of the subject matter of the amendment a the time of filing of the application, the Examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims.[12]

The Examiner must set forth express findings of fact regarding the above analysis which support the lack of written description conclusion. These findings should include:

a) Identify the claim limitation at issue; and

b) Establish a prima facie case by providing reasons why a person skilled in the art at the time the application was filed would not have recognized that the inventor was in possession of the invention as claimed in view of the disclosure of the application as filed. [13]

Applicants respectfully submit that the Examiner has not provided evidence or reasoning to establish a prima facie case. Instead, the Examiner merely has repeated the sections of the MPEP that pertain to a §112, first paragraph rejection, without providing any evidence or reasoning for his conclusion.[14]

Furthermore, the MPEP specifies that regardless of the outcome of 35 U.S.C. §112, paragraph 1 determination, Office personnel must complete the patentability determination under all the relevant statutory provisions of title 35. This includes 35 U.S.C. §101, §112, §102 and §103.[15]

Applicants respectfully submit that the Examiner has rejected the application based on 35 U.S.C. §112, first paragraph, without completing the patentability determination under all the relevant statutory provisions, namely, §101, §102 and §103. Therefore, the Office Action is incomplete.

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[12] MPEP §2163(II)(A) - page 2100-168, second column

[13] MPEP §2163(III)(A) - page 2100-176, second column

[14] See page 2, 35 USC §112 rejection of the final Office Action

[15] MPEP §2163(III) - page 2100-176, first column

Accordingly, withdrawal of the rejection of claims 1-12 is respectfully requested.

II. CONCLUSION

Accordingly, claims 1-12 are believed to be allowable and the application is believed to be in condition for allowance. A prompt action to such end is earnestly solicited.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should a petition for an extension of time be necessary for the timely reply to the outstanding Office Action (or if such a petition has been made and an additional extension is necessary), petition is hereby made and the Commissioner is authorized to charge any fees (including additional claim fees) to Deposit Account No. 18-0988.

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

Kenneth W. Fafrak
Reg. No. 50,689

DATE: August 19, 2004

The Keith Building
1621 Euclid Avenue
Nineteenth Floor
Cleveland, Ohio 44115
(216) 621-1113

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I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450

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